1. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

   A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 2 bacteria-α. After 2 hours, the petri dish has 217 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

   A. About 185 minutes

   B. About 106 minutes

   C. About 17 minutes

   D. About 30 minutes

   E. None of the above

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2. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

   The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 897 grams of element X and after 2 years there is 179 grams remaining.

   A. About 1 day

   B. About 365 days

   C. About 730 days

   D. About 0 days

   E. None of the above

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3. A town has an initial population of 100000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	99965	99925	99885	99845	99805	99765	99725	99685	99645

A. Non-Linear Power

B. Exponential

C. Linear

D. Logarithmic

E. None of the above

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4. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

   A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 2 hours, the petri dish has 2382 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

   A. About 230 minutes

   B. About 38 minutes

   C. About 123 minutes

   D. About 20 minutes

   E. None of the above

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5. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

   Uranium is taken out of the reactor with a temperature of 160° *C and is placed into a* 10° *C bath to cool. After 12 minutes, the uranium has cooled to* 117° *C.*

A. $k = -0.06410$

B. $k = -0.06479$

C. $k = -0.11791$

D. $k = -0.03353$

E. None of the above

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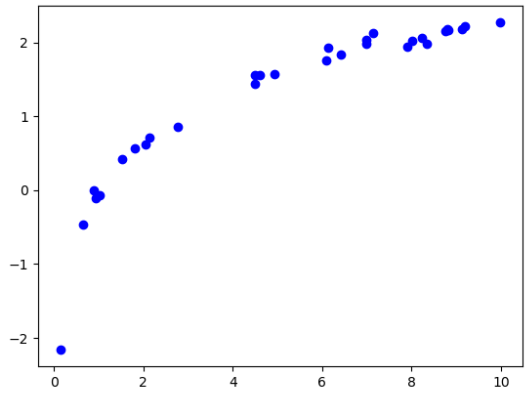
6. Determine the appropriate model for the graph of points below.



A. Linear model

B. Non-linear Power model

C. Logarithmic model

D. Exponential model

E. None of the above

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7. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

   The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is

initially 740 grams of element X and after 3 years there is 148 grams remaining.

A. About 365 days

B. About 365 days

C. About 1095 days

D. About 1 day

E. None of the above

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8. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 180° *C and is placed into a* 17° *C bath to cool. After 34 minutes, the uranium has cooled to* 120° *C.*

A. $k = -0.01642$

B. $k = -0.02237$

C. $k = -0.03556$

D. $k = -0.02201$

E. None of the above

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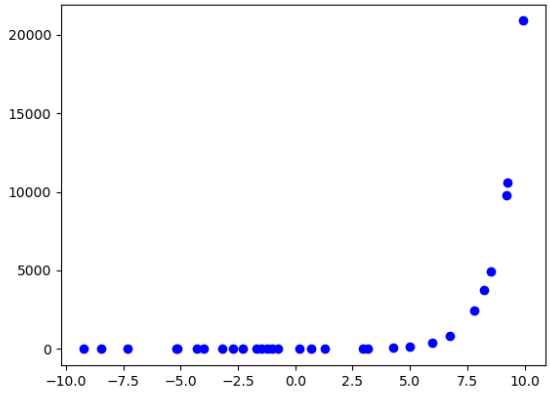
9. Determine the appropriate model for the graph of points below.



A. Linear model

B. Non-linear Power model

C. Exponential model

D. Logarithmic model

E. None of the above

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10. A town has an initial population of 20000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	19972	19938	19904	19886	19852	19818	19784	19766	19732

A. Non-Linear Power

B. Logarithmic

C. Exponential

D. Linear

E. None of the above
